

## IMPROVED PROCESS FOR DEPOSITION OF SEMICONDUCTOR FILMS

### Abstract of the Disclosure

Chemical vapor deposition processes utilize chemical precursors that allow for the deposition of thin films to be conducted at or near the mass transport limited regime. The processes have high deposition rates yet produce more uniform films, both compositionally and in thickness, than films prepared using conventional chemical precursors. In preferred embodiments, trisilane is employed to deposit thin films containing silicon are useful in the semiconductor industry in various applications such as transistor gate electrodes.

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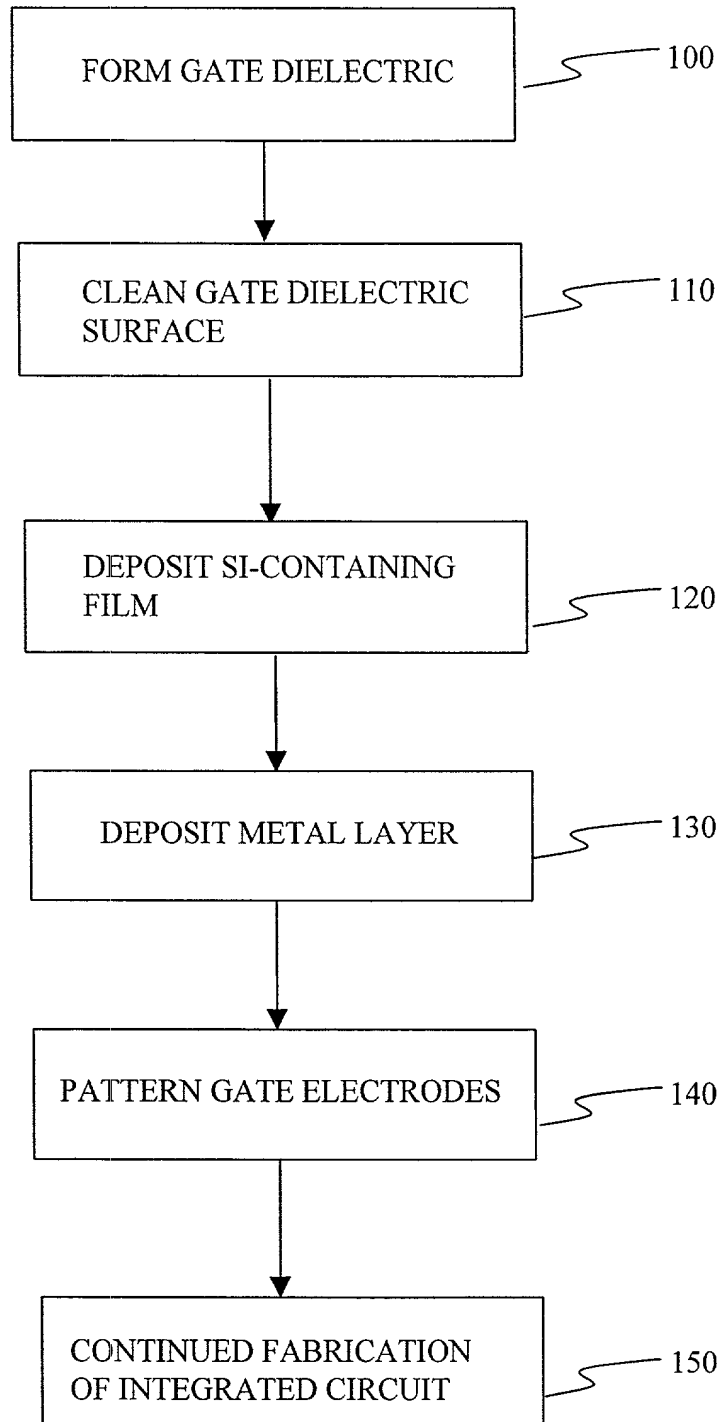
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# Drawings

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FIGURE 1



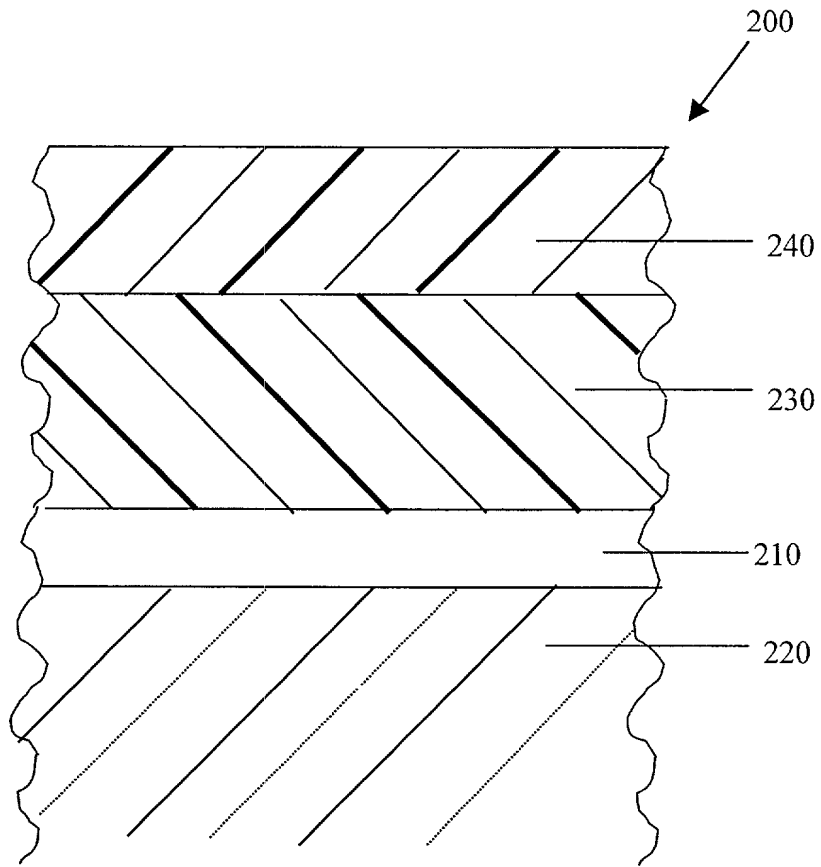


FIGURE 3

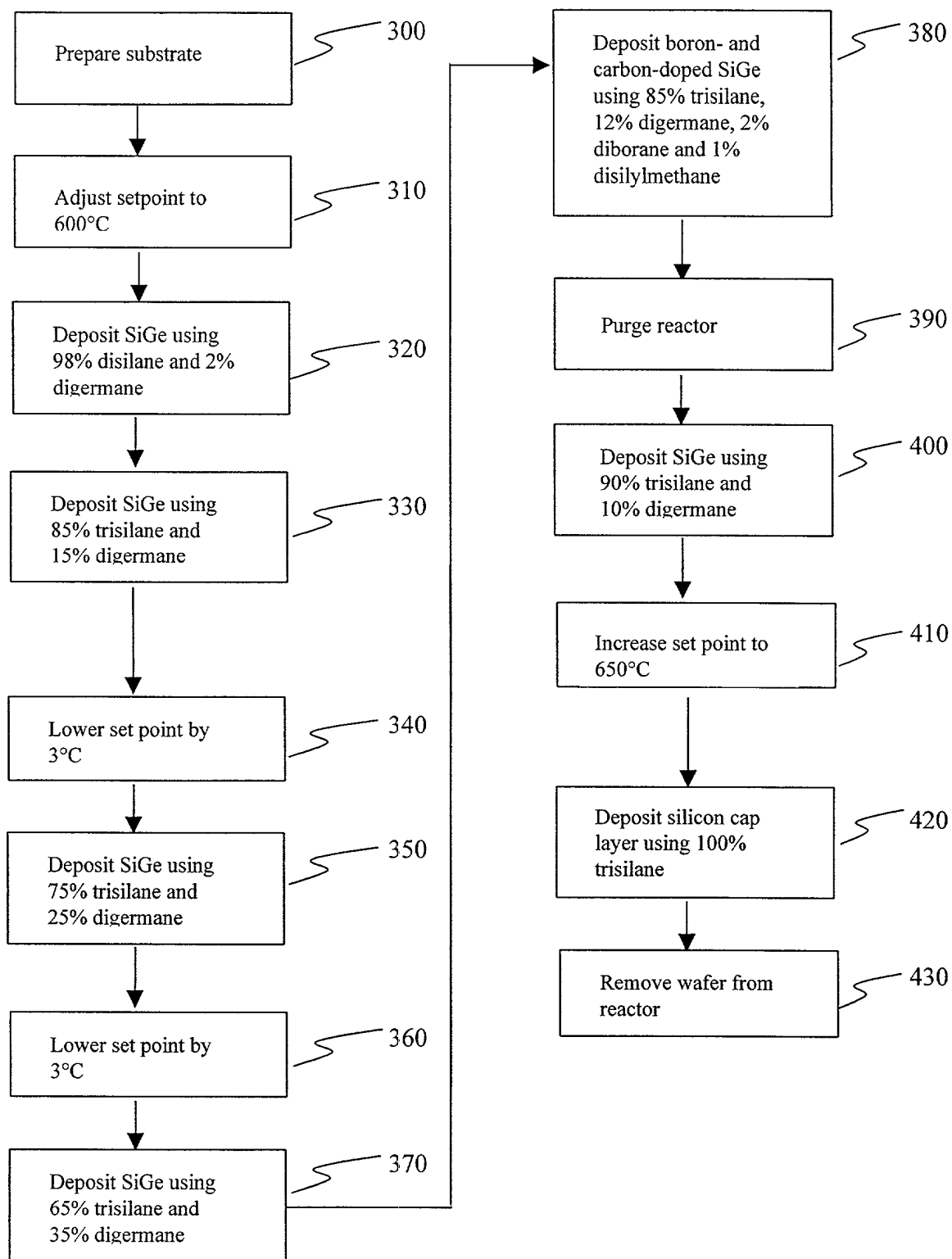
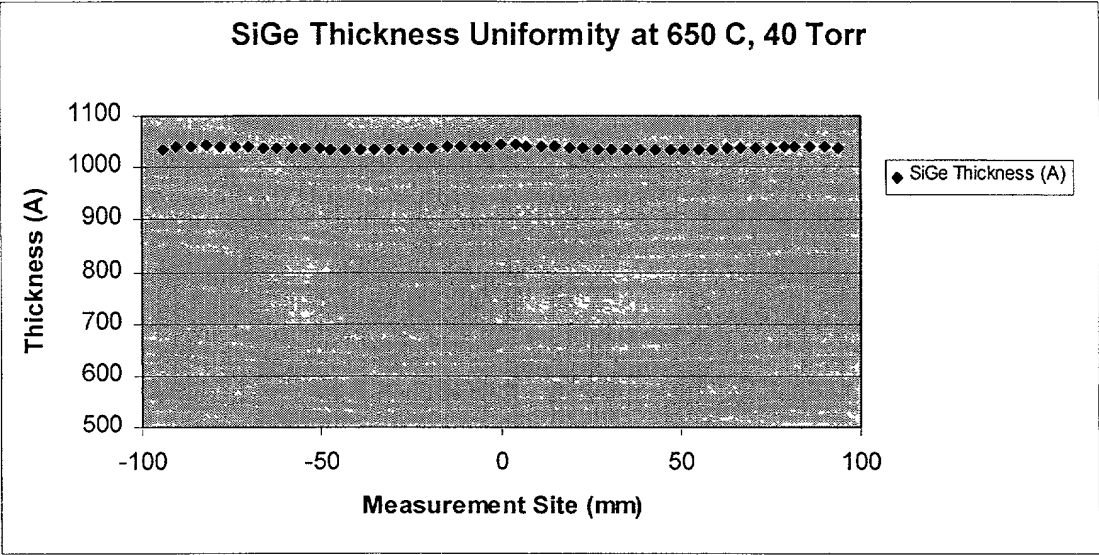
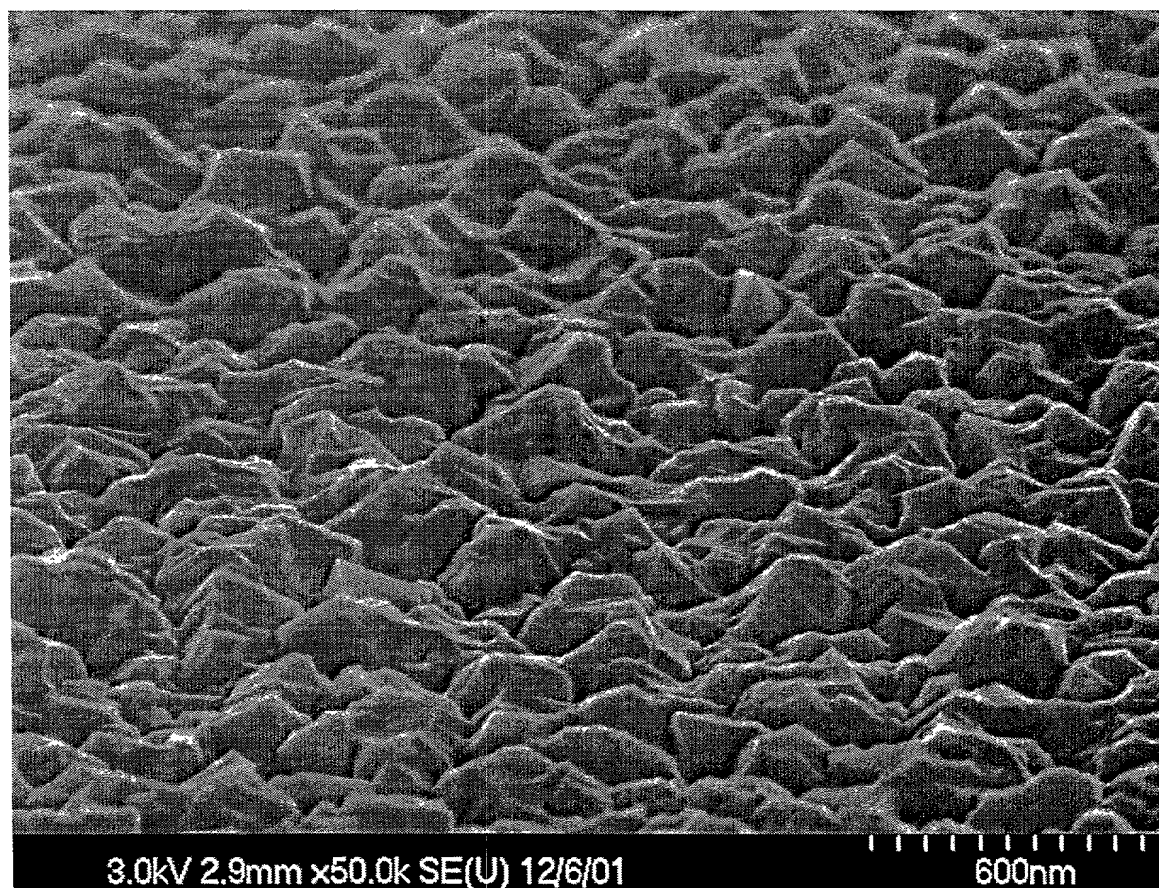


FIGURE 4



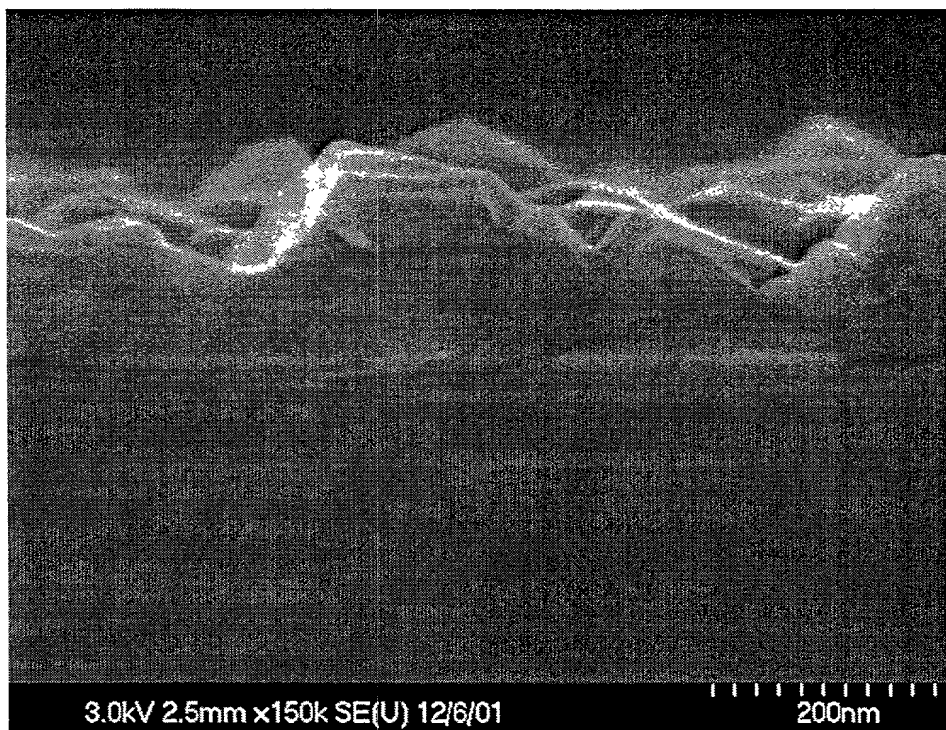
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**FIGURE 5**  
**SEM Photomicrograph of Si-Ge Film Deposited Using Silane and Germane**



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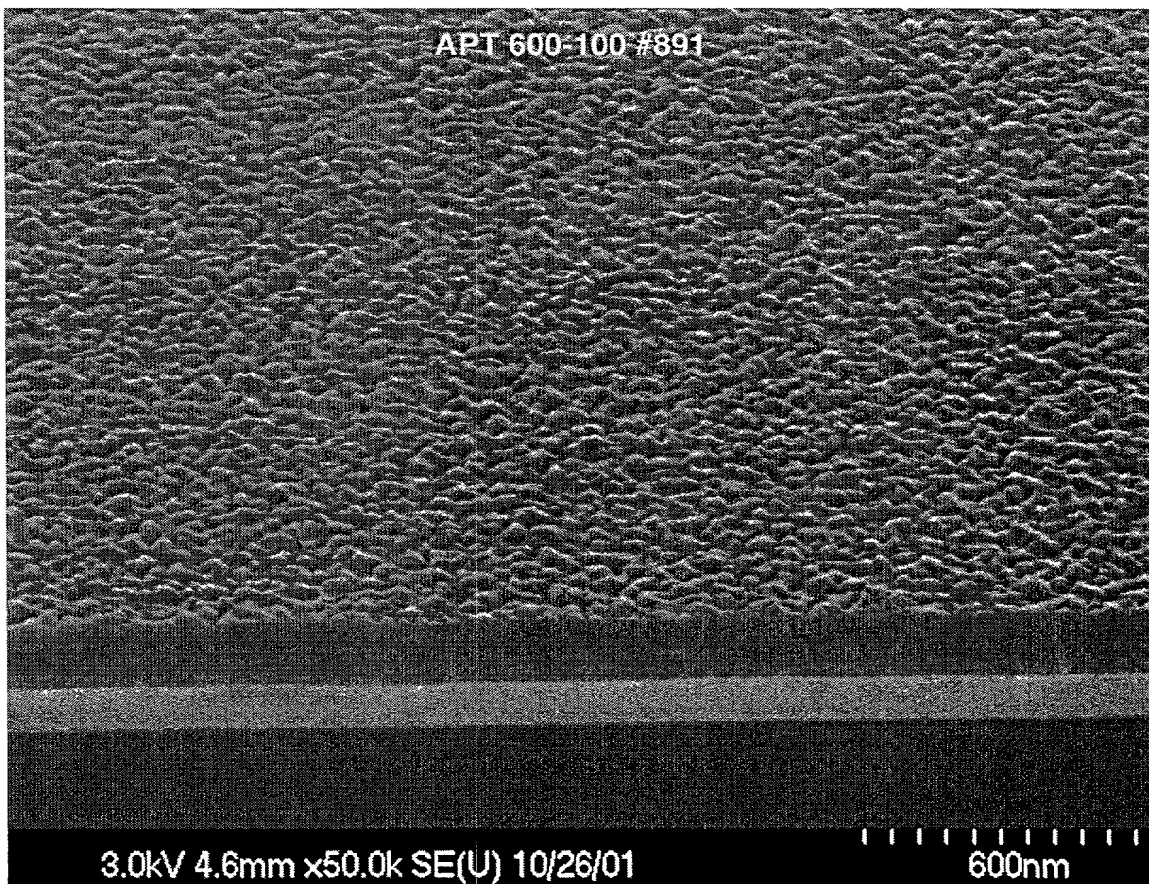
**FIGURE 6**  
**SEM Photomicrograph of Si-Ge Film Deposited Using Silane and Germane**



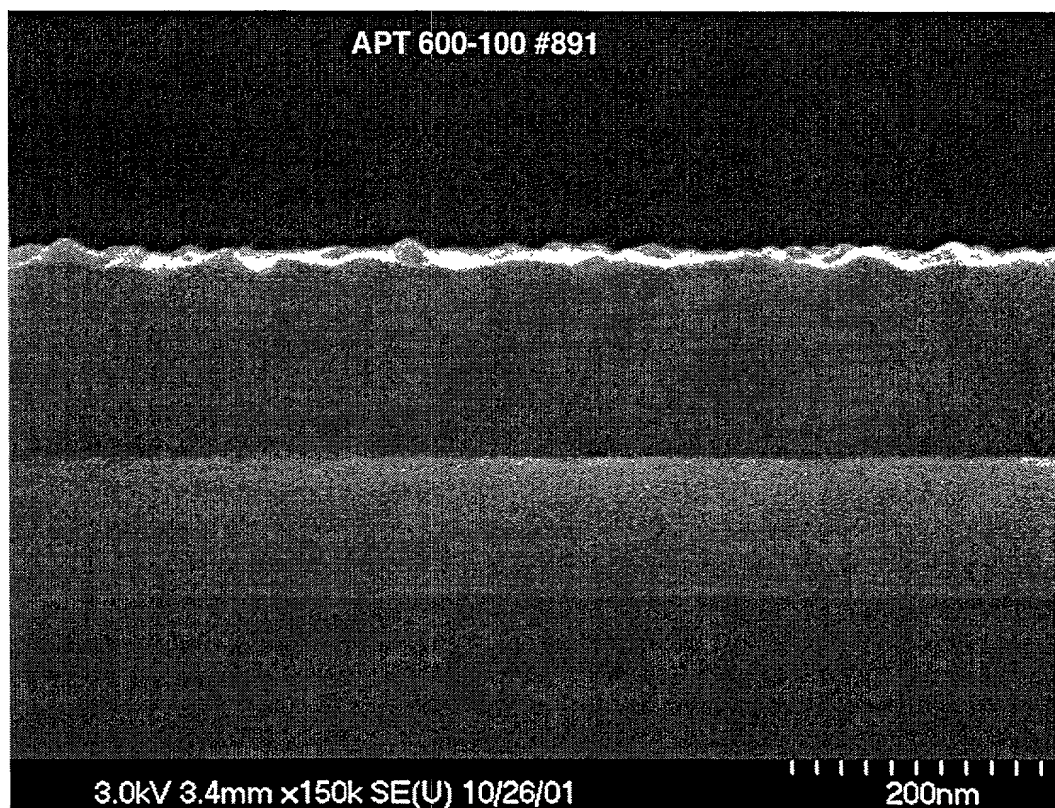
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**FIGURE 7**  
**SEM Photomicrograph of Si-Ge Film Deposited Using Trisilane and Germane**

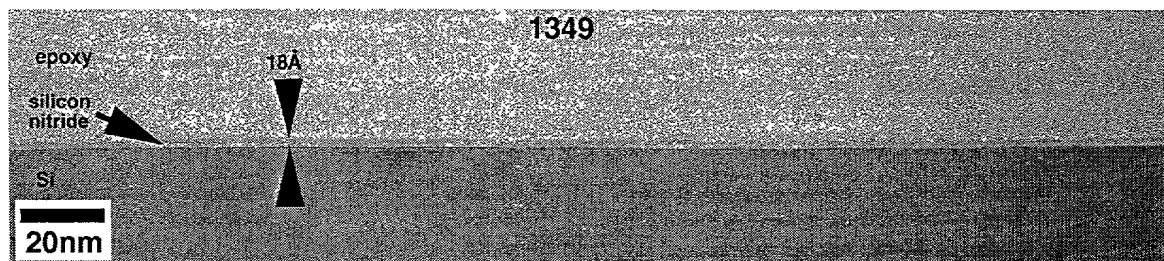


**FIGURE 8**  
**SEM Photomicrograph of Si-Ge Film Deposited Using Trisilane and Germane**



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**FIGURE 9**  
**TEM Photomicrograph of Si-N Film Deposited Using Trisilane and Atomic Nitrogen**



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FIGURE 10  
ARRHENIUS PLOT FOR SILANE, DISILANE AND TRISILANE

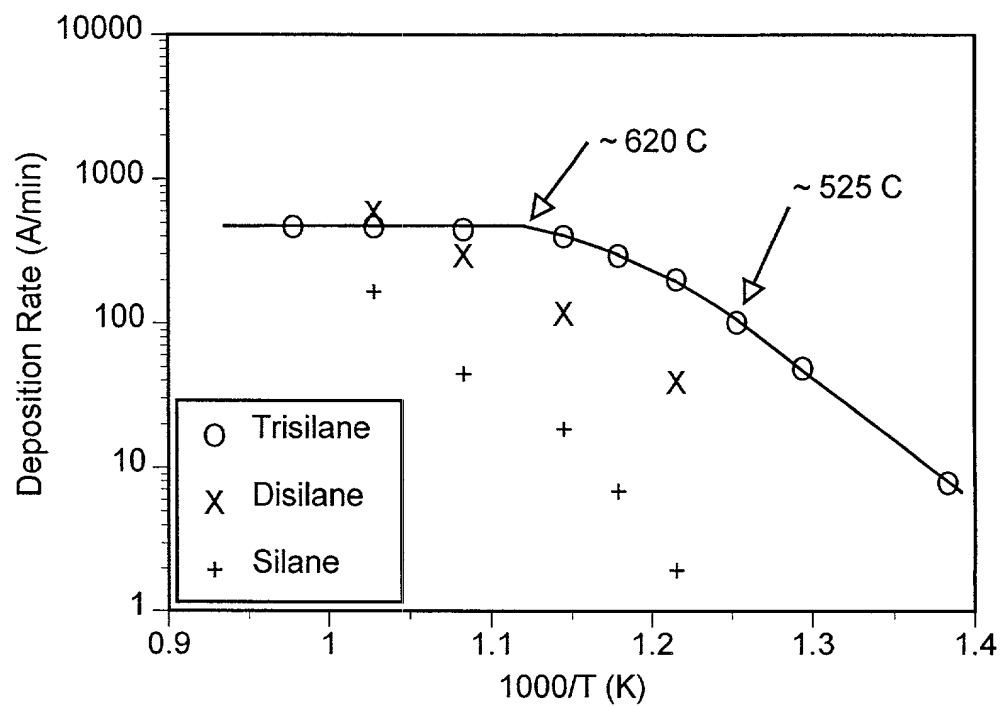


FIGURE 11

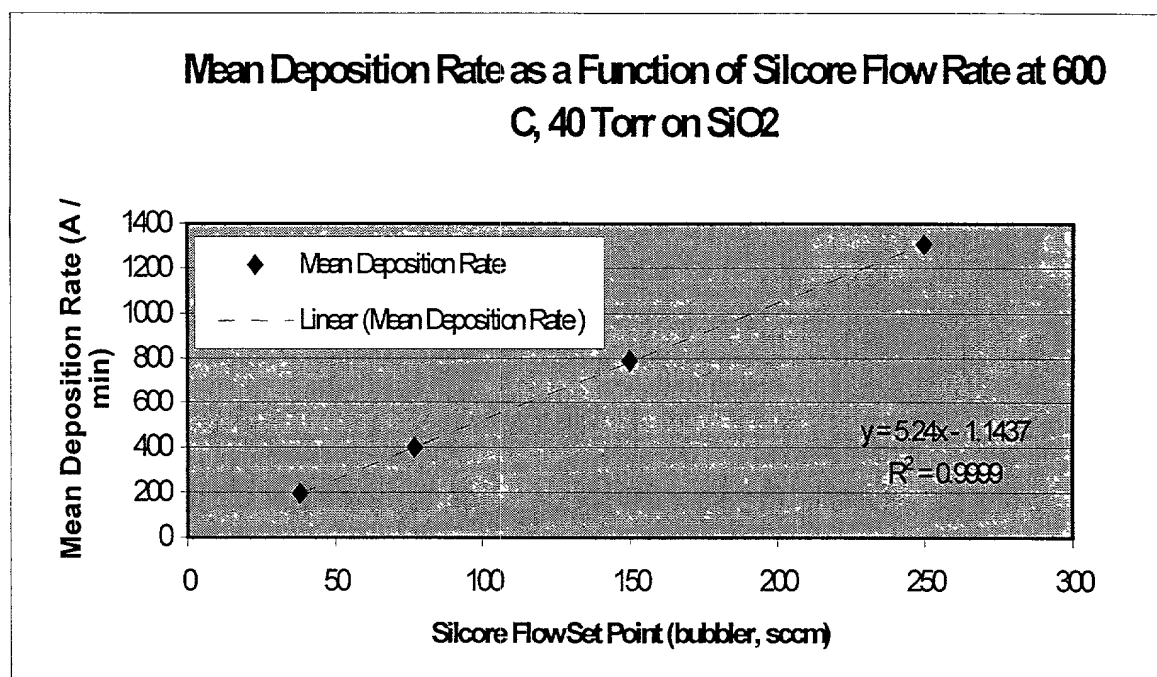


FIGURE 12

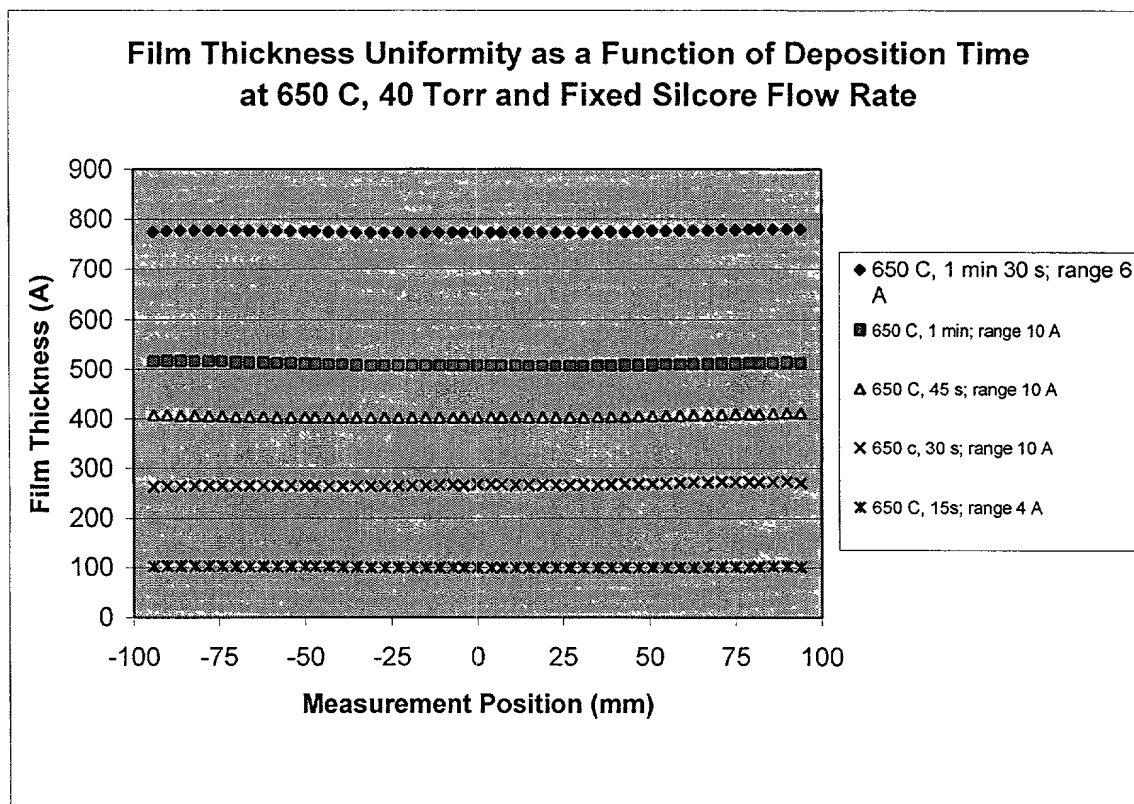


FIGURE 13

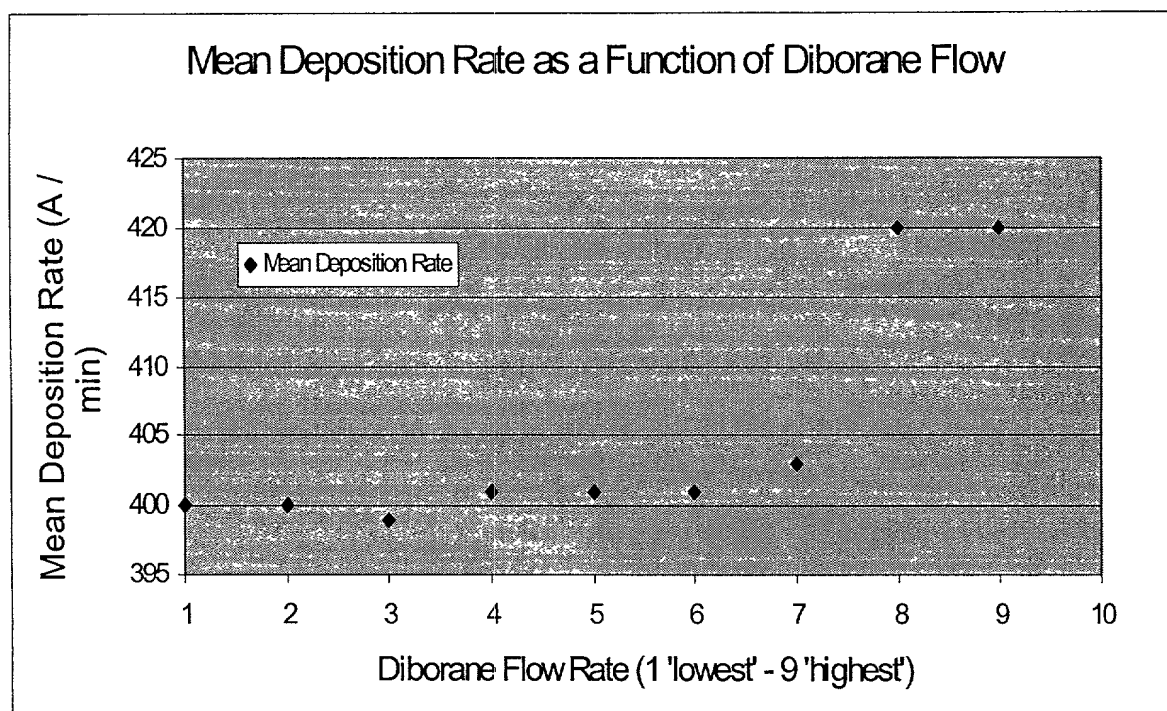
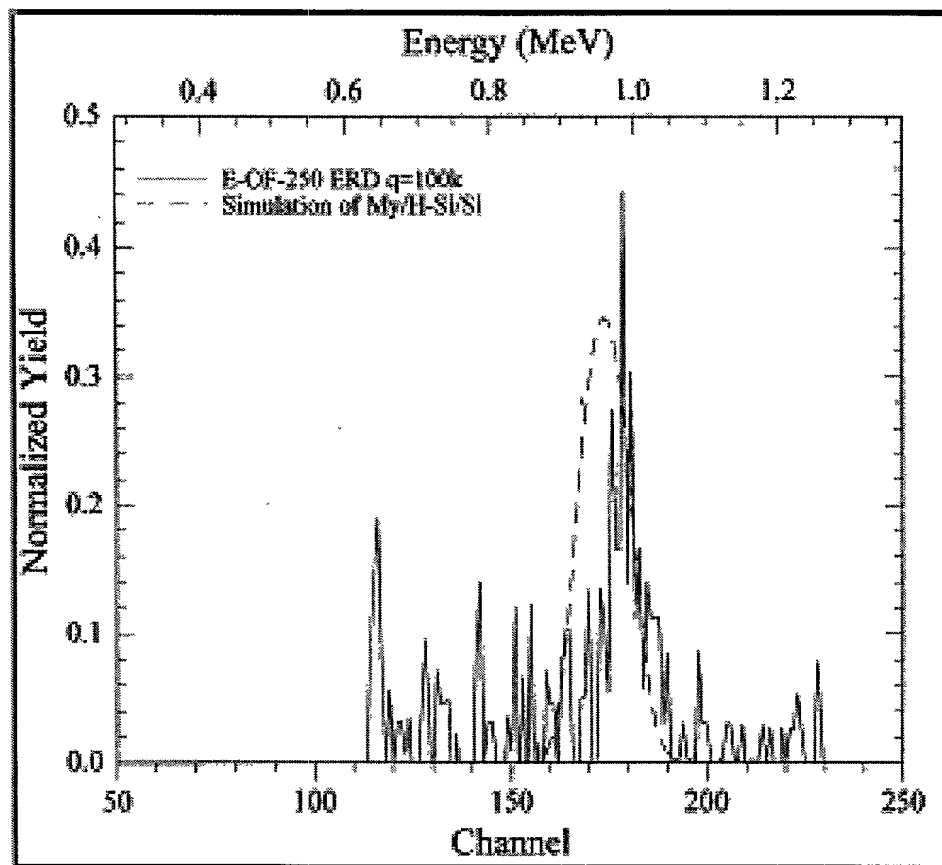


FIGURE 14

RBS ERD SPECTRUM OF AMORPHOUS SILICON FILM DEPOSITED  
USING TRISILANE AT 600°C, 40 TORR



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FIGURE 15

X-RAY DIFFRACTION SPECTRA FOR FILMS DEPOSITED USING TRISILANE  
AT 600°C, 650°C, 700°C AND 750°C (BOTTOM TO TOP, RESPECTIVELY)

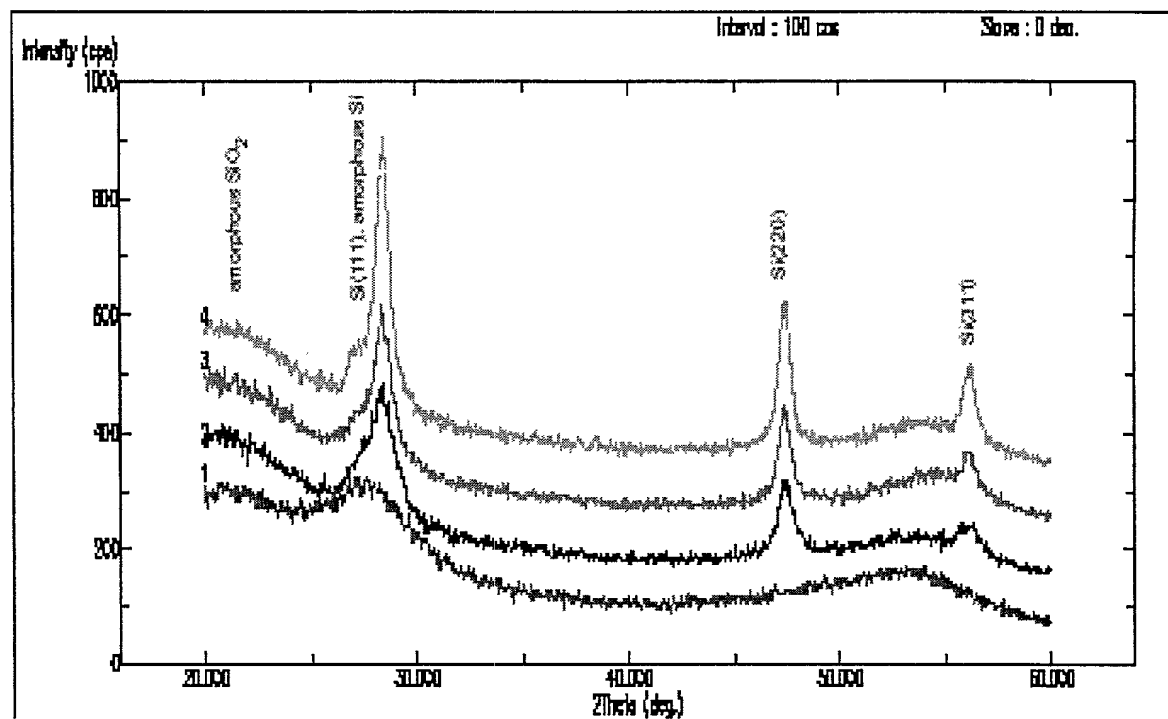
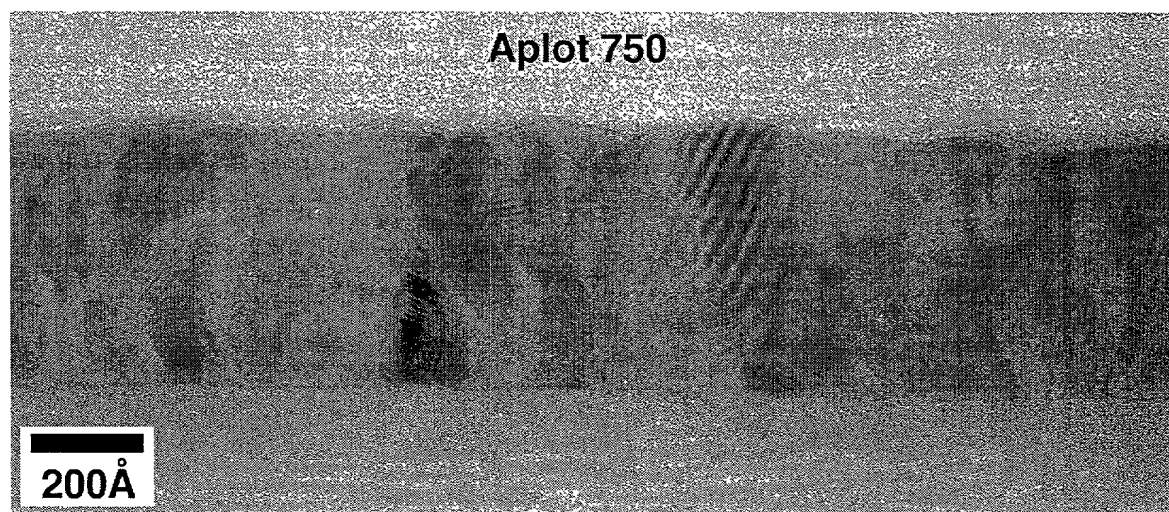
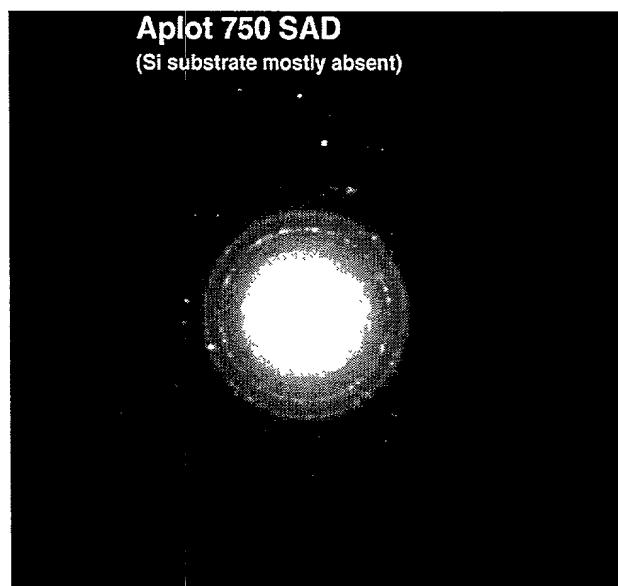


FIGURE 16  
CROSS SECTION OF POLYCRYSTALLINE SILICON FILM



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FIGURE 17  
SAD PATTERN OF POLYCRYSTALLINE SILICON FILM



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FIGURE 18

CROSS SECTION OF CONFORMAL AMORPHOUS SILICON FILM

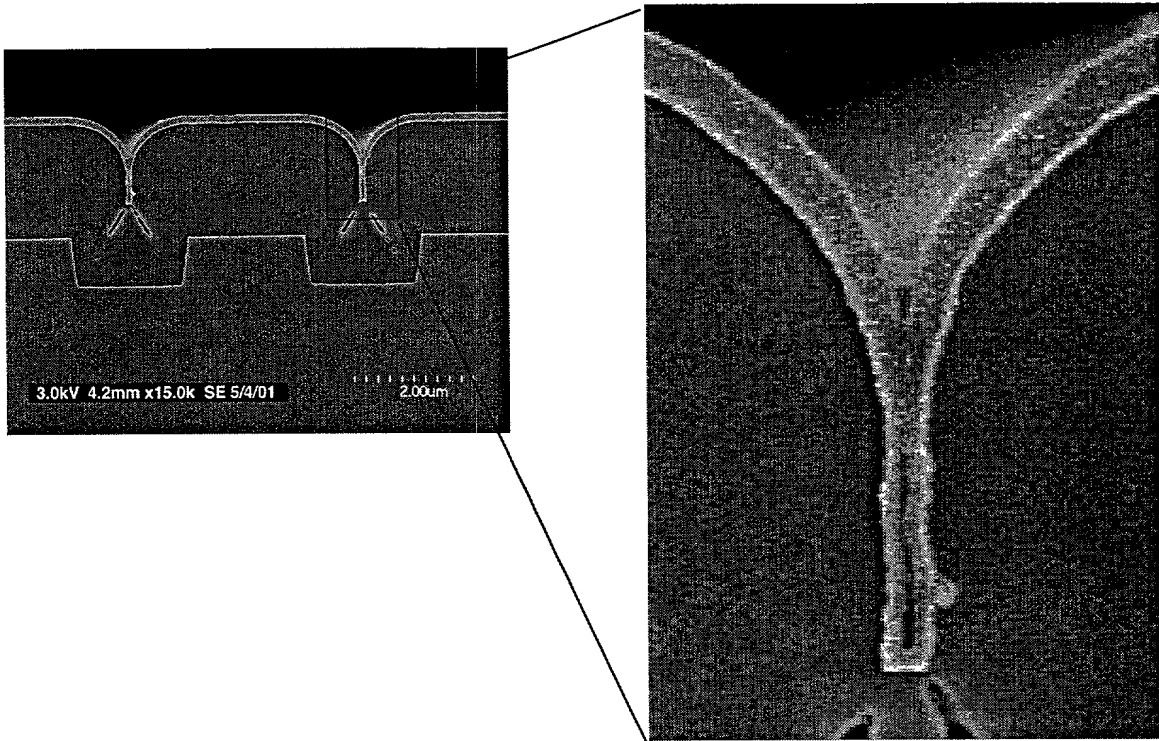
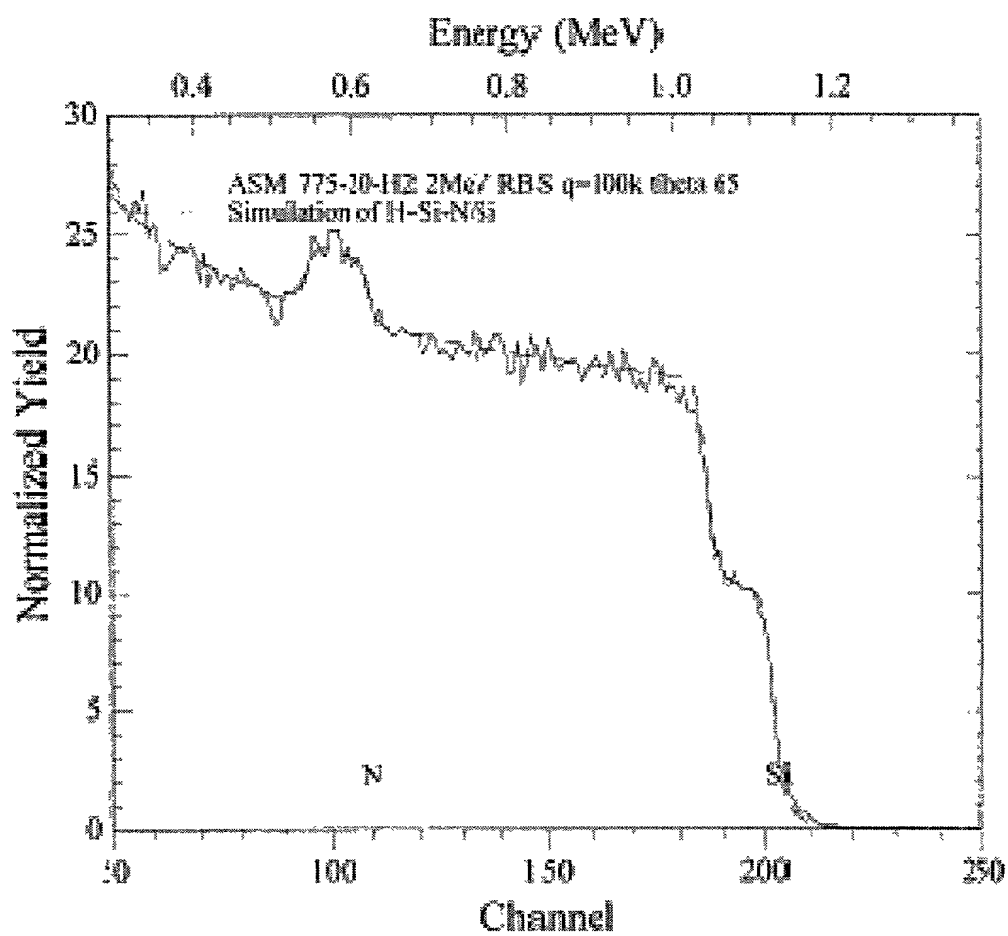


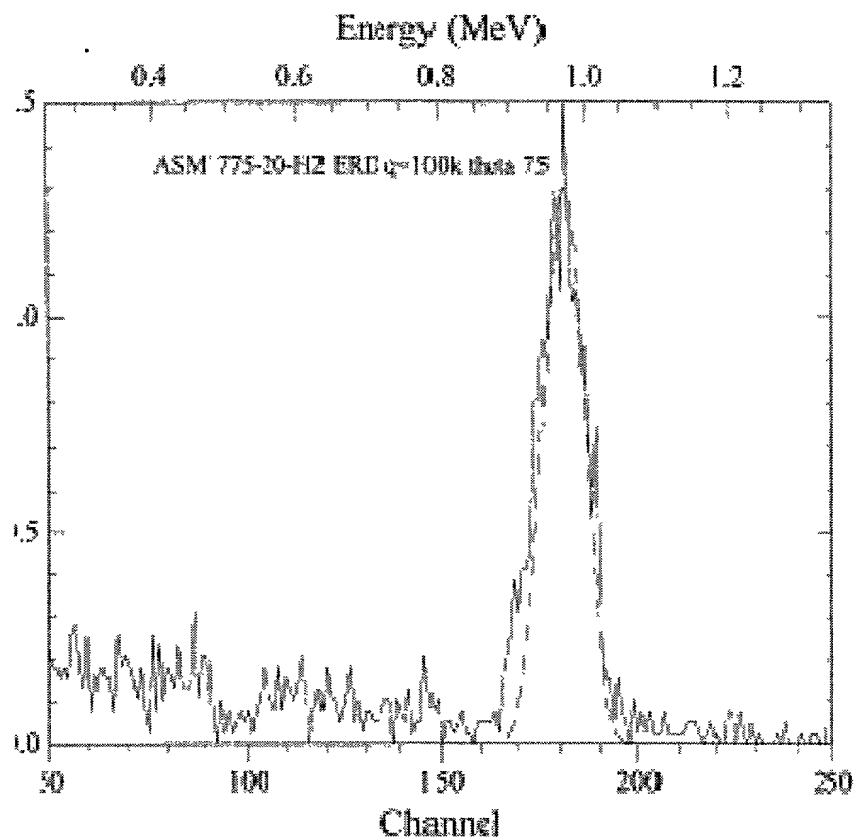
FIGURE 19

RBS SPECTRUM OF SILICON NITRIDE FILM



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FIGURE 20  
RBS ERD SPECTRUM OF SILICON NITRIDE FILM



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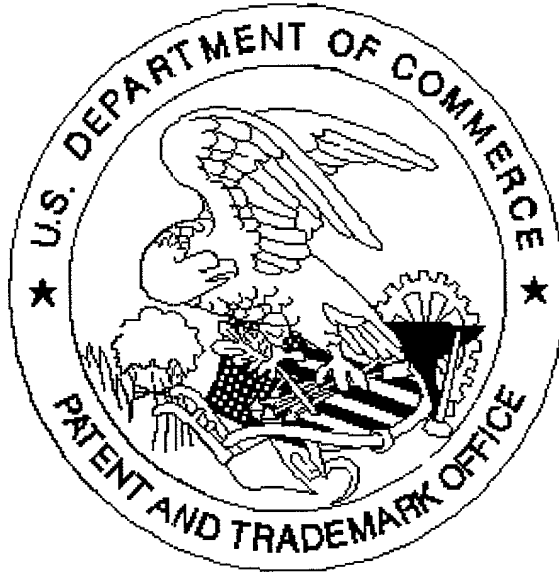
**Miscellaneous**

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Level - 2  
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Updated - 8/01/01

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